

WHAT IS CLAIMED IS:

1           1.       An apparatus for measuring physical properties of a plurality of material  
2 samples, the apparatus comprising:  
3           a moveable sample holder for containing the plurality of material samples;  
4           at least one probe for mechanically perturbing the material samples, the at least one  
5 probe having an end;  
6           at least one actuator connected to the moveable sample holder for translating the  
7 material samples in a direction normal to the end so that the material samples contact the at  
8 least one probe; and  
9           at least one sensor for monitoring the response of the material samples to mechanical  
10 perturbation by the at least one probe.

1           2.       The apparatus of claim 1, wherein the sensor includes force sensors  
2 mechanically linked to the probes.

1           3.       The apparatus of claim 2, further comprising shafts that mechanically link the  
2 force sensors to the probes.

1           4.       The apparatus of claim 3, wherein each of the shafts includes a rigid core and  
2 an insulating outer sheathing.

1           5.       The apparatus of claim 3, further comprising flexure strips attached to each of  
2 the shafts for aligning the probes with the material samples.

1           6.       The apparatus of claim 3, further comprising an isolation block module for  
2 separating the probes and the force sensors.

1           7.       The apparatus of claim 6, wherein the isolation block module has first and  
2 second surfaces and cylindrical apertures for containing the shafts, the cylindrical apertures  
3 extending from the first surface to the second surface.

1           8.       The apparatus of claim 7, further comprising flexure strips for aligning the  
2 probes with the material samples, each of the flexure strips attached to the shafts and walls of  
3 the cylindrical apertures of the isolation block module.





1           31.     The apparatus of claim 1, wherein the apparatus is capable of measuring at  
2     least one physical property of at least forty-eight samples simultaneously.

1           32.     The apparatus of claim 1, wherein the apparatus is capable of measuring at  
2     least one physical property of at least ninety-six samples simultaneously.

1           33.     The apparatus of claim 1, wherein the apparatus is capable of measuring at  
2     least two different physical properties of the samples simultaneously.

1           34.     The apparatus of claim 33, wherein the test methods used to measure said at  
2     least two different physical properties are selected from the group consisting of flexure,  
3     uniaxial extension, biaxial compression, shear, indentation, stress and strain at failure,  
4     toughness, tack, loop tack, viscosity, melt flow indexing, storage modulus, and loss modulus.

1           35.     A system for screening a combinatorial library of materials by measuring  
2     physical properties of the materials, the system comprising:  
3             an array of a plurality of material samples;  
4             at least one probe for mechanically perturbing the plurality of material samples, the at  
5     least one probe having an end;  
6             at least one actuator for translating the plurality of material samples in a direction  
7     normal to the end so that the material samples contact the at least one probe; and  
8             at least one sensor for monitoring the response of the plurality of material samples to  
9     mechanical perturbation by the at least one probe.

1           36.     The system of claim 35, wherein the array of material samples comprises a  
2     flexible substrate coated with materials at discrete predefined regions.

1           37.     The system of claim 36, further comprising a pair of perforated plates, wherein  
2     the flexible substrate is either sandwiched between the perforated plates or bonded to at least  
3     one of the perforated plates.

1           38.     The system of claim 35, wherein the array of material samples comprises a  
2     rigid substrate coated with materials at discrete predefined regions.



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4 monitoring the response of the materials to the mechanical perturbations.

1 50. The method of claim 49, wherein monitoring the response of the materials to  
2 the mechanical perturbations includes measuring forces exerted on the probes by the material  
3 samples as functions of displacement between the probes and the materials.

1 51. The method of claim 50, wherein monitoring the response of the material  
2 samples to the mechanical perturbations includes measuring forces exerted on the probes by  
3 the materials as functions of time.

1 52. The method of claim 49, further comprising relating the response of the array  
2 of materials to Young's modulus, hardness, viscosity, storage modulus, or loss modulus.

1 53. The method of claim 49, wherein the method is capable of screening at least  
2 twelve materials simultaneously.

1 54. The method of claim 49, wherein the method is capable of screening at least  
2 forty-eight materials simultaneously.

1 55. The method of claim 49, wherein the method is capable of screening at least  
2 ninety-six materials simultaneously.

1 56. The apparatus of claim 17, wherein the movable sample holder comprises a  
2 frame and at least two cups, which are slidable mounted to the frame, and at least two  
3 intersecting substrate pieces, with one of said pieces being attached to the frame and the other  
4 of said pieces being attached to the cups.

1 57. The apparatus of claim 17, wherein the moveable sample holder comprises a  
2 frame and at least two weights, positioned in receptacles in the frame, with a known surface  
3 positioned parallel to the at least one end on which the material sample is deposited.

1 58. The apparatus of claim 17, wherein the test fixture comprises a spring poppet  
2 with a cap, said cap having a known surface positioned parallel to the plurality of materials  
3 samples.